Some Considerations in Operational Test and Evaluation

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Purpose

Present an overview of the Director of Operational Test and Evaluation's (DOT&E) role in T&E oversight, and identify some considerations for test adequacy and weapon system dependability

Context

- The Institute for Defense Analyses (IDA) is an FFRDC* that provides technical support to DOT&E
    - This is an IDA briefing containing public-domain DOT&E material, not a DOT&E briefing
- DOT&E's focus is end-to-end operational and live fire testing, not specific functions or technologies (this briefing focuses on operational, rather than live fire, testing)
- DOT&E promotes technologies, however, to support adequacy of common test infrastructure, particularly where there are identified shortfalls
    - Central Test & Evaluation Investment Program (CTEIP)
        -- Resource Enhancement Project (REP)
        -- Test Technology Development and Demonstration (TTD&D)
        -- Joint Improvement and Modernization (JIM)
    - Test & Evaluation / Science & Technology

* Federally Funded Research and Development Center

DOT&E Background

- DOT&E created by Congress in 1983
  - Weapons were not being tested thoroughly or realistically
  - Complete and accurate information was not being disseminated
- Director (currently Mr. Tom Christie) appointed by President, confirmed by Senate, reports directly to SecDef and Congress.
- Responsible for independent oversight of operational and live fire test and evaluation within DoD as outlined in Title X, USC.
  - "Operational test and evaluation means –
    (1) the field test, under realistic combat conditions, of any item of (or key component of) weapons, equipment, or munitions for use in combat by typical military users; and
    (2) the evaluation of the results of such test."
- Has resulted in better testing, better weapon systems

Much of this material is extracted from DOT&E's public web site www.dote.osd.mil

DOT&E Mission

DOT&E will ensure weapons systems are realistically and adequately tested and will ensure complete and accurate evaluations of operational effectiveness, suitability, and survivability are rendered to the Secretary of Defense, other decision makers in DoD, and to the Congress. This is accomplished by providing policy, test approval, and independent reports

DOT&E Responsibilities

- Prescribe policy and provide guidance on all OT&E and LFT&E matters
- Monitor and review all OT&E and LFT&E in DoD, and report annually to Congress
- Member of Defense Acquisition Board (DAB) and Major Automated Information System Review Council (MAISRC)
- Approve test plans for OT & LF oversight programs
- Report to Congress and SecDef on programs, before final Beyond – Low Rate Initial Production (B-LRIP) decision:
  - Adequacy of OT&E and LFT&E
  - Operational effectiveness and suitability
  - Survivability and lethality

Placement Under OT&E Oversight

Some reasons for programs
coming under DOT&E oversight

- Congress or OSD has expressed high level of interest
- Congress has directed DOT&E report as condition for production or progress
- Program requires joint or multi-service testing
- Program exceeds or has the potential to exceed the dollar threshold for a major program
- Program has a close relationship or is key to a major program
- Military significant change to system

DOT&E Focus

- Is testing adequate?
- Is the system operationally effective?

    <u>Effectiveness:</u> The overall degree of mission accomplishment of a system when used by representative personnel in the environment planned or expected for operational employment of the system considering organizational doctrine, tactics, survivability, vulnerability, and threat

- Is the system operationally suitable?

    <u>Suitability:</u>   The degree to which a system can be satisfactorily placed in field use, with consideration given to availability, compatibility, transportability, interoperability, reliability, wartime usage rates, maintainability, safety, human factors, manpower supportability, logistics supportability, documentation, and training requirements

- Is the system survivable and lethal?

Some Adequacy Considerations*

- Production representative system
  - Operated and maintained in accordance with CONOPS and ILS
    - Nature of contractor involvement
    - Adequate resources
  - Limitations identified
  - Challenge at the edge not "heart of the envelope"

- Realistic combat-like conditions
  - Friendly forces
    - Typical user units and personnel vs. golden crew
    - Equipment and personnel placed under realistic stress and OPTEM
    - Realistic tactics
  - Threat forces
    - Realistic tactics
    - Threat-representative forces
  - Environment
    - Operationally realistic environment, signature, targets
    - Counter-measured environment (comm, radar, EO, CM)
    - Terrain and environmental conditions
  - End-to-end testing
    - Interfacing systems

* Extracted from briefing, "T&E Basic Course,"
Colonel Stephen Daly, DOT&E Military Assistant

Operational Suitability

- Many (perhaps most) operational test issues are due to poor suitability, primarily with respect to dependability (reliability, maintainability, availability, and associated "ilities") and/or (lack of) interoperability
  - Will system act as expected whenever it is called upon?
  - Will system operate with other systems in typical conditions?
- Good maintenance design/ planning is key to dependability
- System-of-systems engineering and testing is key to interoperability
  - Test at least one external interface deep
  - Use of common standards and protocols
  - Use of Joint Technical Architecture (DISA)*
    - -- Systems, Technical, and Operational Views

* www-jta.itsi.disa.mil/

Operational Dependability

- Operational Dependability composed of
  - Availability
  - Reliability
  - Maintainability
  } *Impacted by requirements (e.g., MTBF) and specs (e.g., temperature tolerance)*
  - Also impacted by
    -- Safety
    -- Security
  - Challenge is to maintain match between fixed specifications and evolving (e.g., spiral) requirements

- Some technologies increase dependability, but have to watch downside
  - Redundancy (but costly, prone to fault commonality)
  - Embedded instrumentation (but could add complexity)
  - Automated maintainability (BIT/BITE/ATE, etc) and safety **(but prone to false alarms)**
  - Secure user environments (but could add complexity, overly restrict access)

"Testing is the conscience of acquisition."

Honorable William J. Perry
Secretary of Defense

"I see you people as the truth tellers."

Honorable John J. Hamre
Deputy Secretary of Defense